THIRTY-THIRD ANNUAL REPORT

Calendar Year 1943

Northern Rocky Mountain Forest and Range Experiment Station
U. S. Department of Agriculture
Forest Service

Missoula, Montana

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CONTENTS

	Page
General	1
Forest Survey	7
Forest Management	10
Forest Products	17
Range Research	24
Products Supplies Surveys Program	39
Emergency Rubber Project - (Kok-saghyz)	40
Post War Planning	42
Publications	44
Personnel	49
Financial Budget	50

Supplemental Memorandum

GENERAL

The present world conflict has clearly demonstrated the almost immeasurable importance to a nation at war of an unlimited reservoir of natural resources and raw material supplies. Man power is not alone sufficient. A warring nation must have within its boundaries or under its control a large reserve of natural resources, either as yet unexploited or, if in use, well managed. To a nation at peace, an abundance of such resources is the key to continued prosperity.

The United States, because of its ample resources and its great capacity for production, has been able in a little over two years to raise, clothe, feed, and fully equip for service at home and abroad an Army of more than ten million men, build and keep in fighting trim afloat the world's largest Navy, and build and keep flying an Air Force second to none. In addition to all this the United States has supplied its Allies with huge quantities of materials and supplies and the machines and equipment of war.

This has meant an all-out production effort. Never before in the history of this nation has it been called upon to produce such vast quantities of raw material supplies and to manufacture them into the materials of war. Our known deposits and reservoirs of metals, minerals and petroleum have been heavily exploited and new sources are now being sought. Our agricultural lands and forage ranges have been called upon to produce record quantities of food and fibre. Our forests are contributing some 32-36 billion board feet of wood products each year. Such

an all-out production effort was and still is necessary. This nation is indeed fortunate that it had so large a reservoir of natural resources upon which to draw. It is expected also that during the reconstruction period following the war this nation will continue to be called upon to furnish a large share of the world requirements for such products.

Although the nation must continue its all-out production effort until the war is won, it is time now to look to and plan for the future. An abundance of natural resources and raw material supplies are as indispensable to the continued prosperity of a country at peace as they are in winning a war. Such a heavy toll as has been exacted from both our nonrenewable and our renewable resources cannot be continued indefinitely without widespread and disastrous results. Not much can be done to restore our nonrenewable resources to their pre-war abundance. Much, however, can be done with our renewable resources through rehabilitation, proper management, and wise use to make them as fully productive as ever. This is a problem which should be given immediate consideration.

This station has just completed its second full year with the nation at war. It has worked under a program redirected to aid as fully and effectively as possible in the all-out production effort of the government. It is hoped that its research contributions have helped the nation to meet its war requirements for wood products, beef and mutton, leather, and wool. It will continue in this effort.

It is time now, however, to crystallize our policies and plans for the post-war period. We should be prepared not only to start, as soon as the war is ended, a well thought-out program of public works covering all forest and range lands but to recommend and carry into being a sound forest program for the nation.

The drastic cut in fiscal year 1944 forest research funds coming as it did on top of an already understaffed and poorly financed organization, and at the time of the year when planning has culminated in the most efficient use of a limited field personnel, badly disrupted the station's schedule of work. The cut in regular allotments, 28 percent below fiscal year 1943 appropriations, although severe enough for the station as a whole, was very unequally divided between lines of work. Forest Products research funds were slightly increased and Range research allotments were only around 6 percent less than they had been the year before. Forest Management and Forest Survey allotments, on the other hand, were cut 56 percent and 60 percent, respectively.

Plans had to be immediately revised. Action had to be initiated to furlough for lack of funds four regular members of the Forest Survey organization. The Forest Survey crew on the Benewah strip resurvey had to be pulled off and the temporary members discharged after only about six weeks of work. With field work underway a decision had to be made to furlough one or both, depending on the length of time each was employed, of the only two technical men on silvicultural work. By late summer plans had been revised, field work reorganized, and the discharge, furlough, and transfer of employees worked

out in an orderly manner to the best advantage of both the personnel involved and the station's program of work.

Budgeting the regular funds on the assumption that a supplemental appropriation would be made to cover all overtime obligations enabled the station to soften the shock of the immediate separation of regular personnel for lack of funds, and to accomplish with this personnel certain jobs which otherwise would have been left undone. It is imperative, of course, that the supplemental appropriations covering overtime obligations be made and the sooner the better. The allotment of special work funds, such as Emergency Rubber, Emergency Fire Control, and Products Supplies Surveys enabled the station to take on additional work that could not be otherwise done by the organization.

During the year the station lost through separations, military furloughs, and transfers seven (28 percent) of the regular personnel. Two men were inducted into the Army. During the past two years the number of regular personnel was reduced from 36 to 18. This is a 50 percent reduction in personnel over and above replacements and additions. The station is proud of the fact that since Pearl Harbor one-third of the entire original permanent organization has joined the Armed Services. We now have 12 men and women on military furlough.

In spite of the cut in funds, the loss in personnel, and the disruption to plans and organization at the start of the present fiscal year, the station was able to accomplish the work planned under its redirected war emergency program for 1943. Some additional work that might have been done had to be dropped when the cut came. The resurvey of forest resources in Benewah County, Idaho, which had to be dis-

continued shortly after it had gotten underway is an example.

Consistent progress was made on all going projects, some new studies were initiated, and all of the scheduled experimental plot remeasurements were made. The four active experimental forests and ranges were manned and kept open throughout the season as usual, and the physical plant set-ups and improvements at these field stations were maintained. Administration (Region One) contributed to the upkeep of improvements at these stations by either the allotment of funds for labor and materials, or by the assignment of Italian internees as was the case at Priest River.

During 1943 staff members at the station participated in the post-war planning program at regional, state, and local levels to the extent of some 54 man-days. In addition, staff members prepared the preliminary estimates for projects that could be done under both a short-time and long-range program in the field of research and participated in planning a comprehensive public works program on all forest and range lands in the region.

The Division of Range Research again helped out in the kok-saghyz experiments under the Emergency Rubber Project. Trials, seeking additional information on the pretreatment of seed, time of seeding, rogueing, thinning, seed collection, and viability of seed were run on three 1-acre plots of Russian dandelion at Miles City, Montana. The station also pretreated the seed used by the Region and gave technical advice and otherwise assisted with the kok-saghyz program at Missoula, Montana.

Under the Products Supplies Surveys program, in cooperation with the War Production Board, the station met all requests for information. In addition to the regularly scheduled reports on factors affecting production, log inventories, and monthly lumber production and stocks on hand surveys, the station prepared special reports on the transportation of forest products, the fuelwood situation, the food rationing problem in the lumber industry, the labor situation, and the effects of certain maximum price regulations such as M.P.R. 460 (stumpage) and 348 (logs) on lumber production.

From the large fund of basic information on the timber resource and its utilization, on file in the Divisions of Forest Survey and Forest Products, numerous requests dealing primarily with the nation's demands for more wood products have been filled. Forest Survey alone has filled some thirty requests for special information on resources, most of which involved additional compilations and adjustments of resource data.

The station is making every effort to get into print as early as possible the useable results of its investigations. The tabulation which follows lists by divisions the bulletins, articles, and research notes published during 1943.

	Department bulletins and circulars	Articles in scientific and trade journals	Station papers, Forest Survey releases and research notes	Total
Range Research	1	8	0	9
Forest Products Research	0	0	7	7
Forest Management "	0	5	1	6
Forest Survey	0	0	6	6
	1	13	14	28

This accomplishment is at the rate of two publications apiece for each of the 14 technical men who were at this station all or part of the past year. The tabulation does not include progress reports prepared for our own files or the numerous "restricted - not for publication" reports prepared for the War Production Board under the Products Supplies Surveys program.

Station plans for 1943 contemplate a concerted attack on all phases of the research program as originally reoriented to meet war-time needs and as further circumscribed by the decrease in funds suffered during F.Y. 1944. Short-term studies and surveys will be undertaken to fill gaps in information urgently needed by war agencies. Participation in the post-war planning program at regional and state levels will be increased and some of the jobs of detailed project planning for the public works program set-up will be undertaken. The publication and release of some twenty-five circulars, articles, station papers, and research notes are contemplated for 1944.

A brief resume of the accomplishments and results for 1943 and the plans for 1944 by divisions follows.

FOREST SURVEY

Survey started the year with 6 regular employees and 3 W.P.A. workers and ended with 3 regular employees. W.P.A. was discontinued in March, one worker being carried on regular allotment through June. Three temporary field men worked on the Benewah strip resurvey during June and part of July. Between June and December 3 regular members - Royer, Miss Forney,

and LaCasse - transferred to the Region and Miss Mead was shifted to the Products Division of the station.

Accomplishments During 1943

Statistical reports were issued for western Montana and for three counties in eastern Montana, Chouteau, Fergus, and Judith Basin, the format being revised and expanded to include more detailed information that was available but not hitherto published. The report on the "Forest Situation in Ravalli County" was completed and published.

Statistical tables for western Montana by individual national forests were completed and, funds permitting, will be released during this fiscal year. Although this information has been available by counties for the national forests as a whole, it had never before been summarized by individual national forests except on special request.

A rough draft of the western Montana report is about 50 percent complete. The tracing and color-cut sheet for the 1/8-inch-to-the-mile lithograph cover type map to accompany the western Montana report is about 90 percent complete.

Approximately 50 percent of Benewah County was covered in a strip resurvey. A combination of bad weather, shortage of manpower and, after the beginning of the fiscal year, lack of funds prevented the completion of this job.

Survey compiled the statistical data and cover type maps relating to forest resources, drain, and employment for post-war plans in northeastern Washington, North Idaho, and for some phases in South Idaho.

Miscellaneous accomplishments included the preparation of a cover type map of western Montana for the War Production Board, and some thirty requests from federal and private agencies for special information on resources involving additional compilations and adjustments of survey data.

Survey information on the Minton Lumber Company holdings was used as a preliminary check on the feasibility of an exchange of Forest Service stumpage for land and residual stands of mixed species to enable the company to operate during the emergency. A subsequent 5 percent cruise, disregarding volumes in fringe areas, showed a volume of 58 million board feet, log scale, in comparison with a survey volume of 60.5 million feet.

At the request of the Washington Office Lawrence Zach of the division undertook an analysis of the theoretical possibilities and an examination of field conditions in order to determine the practical application of sample log scaling in Region One. Due to the large number of commercial tree species being utilized, the wide range in log sizes, the wide spread in stumpage value between species, the method of logging (hot logging) generally employed, and the arrangements made for scaling and use of scalers, the study showed that there appeared to be little application of sample log scaling possibilities in Region One that would result in a saving of man-power and money and still assure acceptable volume estimates of timber sold. Results of the study were made available to Timber Management in the form of a mimeographed letter. A Forest Research Note, No. 31, "The Application of Sample Log Scaling in Region One" was also prepared and released

for the information of technical men.

Plans for 1944

1. Release a statistical report for western Montana by individual national forests.

2. Complete the manuscript for the Western Montana report.

3. Funds and man-power permitting, complete the strip survey in Benewah County, Idaho, and, if possible, in Kootenai County.

FOREST MANAGEMENT

Following Wellner's enlistment in the Navy in December 1942, silvicultural and fire research work were combined in one Division of Forest Management under one division chief. To centralize and expedite the clerical work of this consolidated division and to furnish compilation services that were lost when former employees were drafted, a competent clerk-stenographer was added to the staff. Regular personnel of the division is now limited to the division chief, a P-1 junior forester on silvicultural work, an SP-5 acting superintendent at Priest River, and the division clerk-stenographer. Funds have also limited the employment of temporary personnel to a very few man months of field assistant and common labor help. The detail of two Civilian Public Service Selectees in September on silvicultural plot remeasurements and their present assignment as caretaker and meteorological observer at Deception Creek for the winter were "life savers."

Old Projects - Accomplishments and Plans

Routine measurements of weather, fire danger, streamflow, and the moisture contents at different depths in large logs were con-

tinued at Priest River during the summer by the use of a female field assistant, formerly a school teacher in the local Priest River Valley. Measurements and recordings in these same studies will be made again in 1944.

As no calls were received from the military for any additional advice and guidance at military posts in this region, Gisborne was not required to give any time to this work during 1943.

The spring work of remeasuring 82 silvicultural plots was done by Helmers, employing his wife as field assistant on an hourly basis of remuneration. The load of fall work comprising some 97 plots required much more help, however, and Helmers handled this very successfully aided by the two C.P.S. men, one month's assistance by Stickel, a couple weeks by John Tinn who was borrowed from the Forest Products staff, and a few days of combined help and planned inspection by Gisborne. Six plots remain to be done in the spring of 1944, while 75 are scheduled for fall remeasurement. The big load will come in 1945 when 114 plots are scheduled.

Results obtained from the 1943 remeasurements of two sets of thinning plots and three tests of pruning will be worked up immediately because these are lines of work proposed for extensive post-war application. One result already evident as justifying the thinning of young ponderosa pine stands is the increased resistance to snow breakage shown by our thinned plots. The unbroken canopy of unthinned stands obviously intercepts more snow, accumulates a greater crown weight in proportion to stem diameter, and in consequence produces

more leaning saplings which in turn push against other crowns or stems soon creating large openings of cancerous characteristics. The more widely spaced crowns in the thinned stands, however, afford more space for swaying of the tops in light winds and this naturally sheds much of the snow before it accumulates to a steady pressure sufficient to bend or break the stem.

The three sets of pruning plots at Priest River, Deception Creek, and Bovill already show conclusively that if pruning is used as a post-war project it must be done in moderation and under careful supervision. The removal of three-fifths of the live crown length has proved to be fatal in half the cases in both ponderosa and white pine trees averaging 6 or 8 inches in diameter. To avoid a marked setback in both height and diameter growth not more than one-third the live crown length can be removed by pruning.

New Projects - Accomplishments to Date and Plans

No new projects have been commenced or are planned in silviculture. In fire research, however, three new departures are under way. The first is an attack by Gisborne on the long-troublesome problem of rating fire danger in the grass types, particularly the dense grass on the extremely steep slopes of the great Salmon and Snake River drainages. This work, which is actually an overdue development of past fire research, is being started now partly to meet Region One needs but largely to comply with the desires of National Fire Chief P. A. Thompson and the Region Four Fire Chief, Floyd Godden. To date the only time spent has been for (1) an 800-mile airplane trip with Thompson and A. A. Brown observing the

prevalence and location of grass types on the Salmon, Challis, Boise, Payette, Idaho, Nezperce, and Bitterroot Forests, and (2) a meeting at Riggins, Idaho, to discuss this problem with Godden, five representatives of the Nezperce and Idaho Forests, and three fire supervisors of the Grazing Service. Objectives of research work to be done at Riggins Ranger Station and at Priest River during 1944 were agreed upon at this meeting. Detailed records of all measureable factors in the grass type will be made at Riggins. Basswood slats used in the Southeast for measuring fast changing fuel moistures have already been obtained through C. L. Hayes of the Appalachian Station for testing in grass at Riggins and Priest River. At the latter station a girl forestry student, specially trained in bomb calorimetry, will make calorie-per-gram and moisture-content determinations of grass and weed samples collected near actual grass fires by men who attended the Riggins meeting. This work plus the desire of Region Four for advice and guidance in fire danger measurement has resulted in arrangements for Gisborne to extend his field to include the northwestern forests of Region Four in addition to all forests in Region One.

The second new project in fire research has for its purpose the finding of some method of first measuring and later of estimating with a semblance of dependability the decrease in fire danger from year to year that occurs in fire, insect and disease killed debris, and in logging slash which is left on an area to leach, decay, disintegrate, and finally disappear. Such information is

needed for fuel type classification, and in fuel reduction work and slash disposal practices in the different timber types of Region One. Samples have already been collected of white pine slash fresh cut and 10 years old. Nothing but heat content determinations by use of our bomb calorimeter are contemplated this year. This study ties in closely with the calorie-per-gram or heat-content determinations that need also to be made on the grass and weed samples taken in connection with the problem of rating fire danger in the dense grass types on the extremely steep slopes of the Salmon and Snake River drainages. By combining these fuel tests for the two studies we can very conveniently expand the limited knowledge in this field acquired by Dr. Richards six or eight years ago and published in the Journal of Agricultural Research issue of June 15, 1940. With the present questioning of Region One slash disposal policies uncovering such a wide difference of opinion on how long slash continues to be a fire menace, there is urgent need for accurate knowledge of heat contents of slash of various types and ages.

The third, most important and most costly new departure of our fire work, perhaps should not be rated as research. The job is a short one, probably not requiring a full year's work by one man, and C. K. Lyman, The man being obtained to do the work, is being merely borrowed from the administrative field. It is being financed entirely from funds made available to the division by the Washington Office of Fire Control.

The job here will require two distinct steps. The first will be to get agreement, if possible, among higher officials of the Region and perhaps the Service concerning the social and economic grounds on which we are to justify the extensive and many million dollar job of hazard or fuel reduction after the war. The second step will be to state those principles clearly for the benefit of all concerned, and to specify in detail for the benefit of crew foremen just what shall and shall not be done on the ground in putting these principles into practice. Because of the amount of money likely to be spent on post-war fuel reduction and because of the possibility of peace by 1945, this job has an obviously high priority.

The wide divergence of opinions among Region One officials as to the justification, hence amount of fuel reduction which should be done in this region, is ample evidence of the need of assigning some one to this job. One "school" assumes the premise that no fuel reduction should be done except on those areas where fuels are so bad that by reducing them the costs of future fire control - for lookouts, smokechasers, crews in that vicinity - can be reduced by an amount equal to or greater than the cost of the fuel reduction. This might be called the "Hard Dollar School." By their standard the amount of post-war fuel reduction in Region One would be a matter of only a few million dollars. Determination of where such work should be done is merely a matter of figuring presuppression costs according to fuel types.

The other school of thought on this subject leans far beyond the justification of a dollar saved for every one spent. This

school might be called the "Synthetic Benefit School" because they believe that dollars spent on fuel reduction are worth all that you can put into or stretch out of them. Members of this school admit, of course, all the benefits obtainable under the Hard Dollar criterion, but they maintain that fuel reduction work can also be made to build up many other benefits, some of which cannot possibly be assessed in dollars. Some of these are: (1) the increased growth of timber, grass, wildlife, etc., which will occur on the bad-fuel spot after the mess of fire trash or logging debris has been removed; (2) the reduced chance of loss of timber and other values now existing adjacent to and extending perhaps for several miles outside the bad-fuel spot proposed for treatment; (3) the benefits to local labor, community manufacturing, and transportation which will accrue as a result of both (1) and (2) above.(These indirect benefits are the same as those claimed by Show and Ketok as "downstream federal financial interests" benefited by fire control which prevents erosion and floods. These benefits include more work for local residents in future logging, more logging trucks bought in Detroit for use in Idaho, more work for down-river residents manufacturing these logs into products then shipped over railroads which pay taxes in states far removed from Idaho); and (4) the national, humanitarian benefit of offering self-satisfying jobs to returning soldiers and sailors so that they may avoid the epithet of "leaf raking" while marking time between demobilization and the industrial boom, if and when it comes.

Full agreement between these two schools of thought is not to be expected. But to embark on a post-war project already estimated

as a 22-million-dollar (three year program) job on national forests alone without first bounding the project between margins more nearly parallel then these two jobs is obviously a study of highest priority. A "Fuel Reduction Handbook" will be the final product of this study. It should fill a marked void in the work guidance library of this region because at present the sum total of written instructions in this field is a 3-page L-Recreation circular letter dated May 2, 1938, applying only to roadside beautification.

FOREST PRODUCTS

In this division there was little deviation from the pattern followed during the preceding year. In addition to our regular products supplies projects, classed as aids to winning the war, much special information prepared in response to emergency calls from war agencies, public officials, manufacturers, and farmers was distributed.

Generally speaking, the most time-consuming activities were those of a statistical nature. Nevertheless by drawing upon the accumulated results of our other continuing projects, we were in a position to furnish recommendations and data requested in connection with wood preserving, logging and milling, and various utilization problems.

Accomplishments During 1943

A. Products Statistics

In January 1943 summarized records, tables, and explanatory information pertaining to production, stumpage values, and the cost of logging cedar poles and piling in Inland Empire territory were submitted to the Pacific Northwest Station for incorporation in a special report requested by Peter A. Stone of the Office of Price Administration.

A few weeks later compilations showing the total 1941 cut of sawlogs by seperate species for Montana and Idaho and also the footage of logs that changed hands in that year were furnished F. H. Brumdage, Western Log Administrator, Portland, Oregon.

Statistics available in this office made possible the immediate release of stumpage price data covering individual public (Forest Service, Indian Service, and State) sales of timber throughout the northern Rocky Mountain region needed as a guide by the sellers of private stumpage in connection with W.P.R. 460 "Fixing the Maximum Stumpage Prices of Western Softwood Species."

Log prices and production figures collected currently by this office, separately by species and log production areas, made it possible to appraise the effects of W.P.R. 349 "Maximum Log Prices" on log production within the region and to judge the validity of the log prices set within the several zones.

While conducting the annual cooperative lumber census, preliminary estimates of the 1942 lumber cut and change in lumber stocks in Idaho and Montana, prepared for use by WPB, were submitted on March 13, and on May 21 the canvass of all sawmills in the two states was reported closed. Total production and cut by species figures, shown by our preliminary summaries released in July, proved to be in exact agreement with the final figures released by the Bureau of the Census in November 1943.

Montana's cut of 433,099 M feet b.m. in 1942 - showing an increase of 15.8 percent over 1941 - was the largest ever reported for this state. A total output of 930,368 M feet in Idaho represented an

increase of 2 percent over 1941.

Special compilations of 1942 lumber production in Region One and southern Idaho by counties were released.

For Montana, northern Idaho, and northeastern Washington the combined cut of sawed railroad cross ties totaling 2,797,000 ties, equivalent to 112,000 M feet b.m., was the largest on record. Information contributed by the railroads for use in our latest review of cross tie specifications and prices indicated that since May 22, 1943, when RMPR No. 284 became effective, all of the railroad companies operating in Region One have been paying approximately the full ceiling price to producers in the Inland Empire district, with no discrimination between large and small producers. This no doubt resulted in the large increase in deliveries during the past year.

In August, while a comprehensive check of the domestic fuelwood situation in various cities was under way, a brief survey conducted by the division indicated that for Missoula the total prospective supply of fuelwood would be approximately 1,500 cords below requirements. As a result, construction of a short logging access road extension sponsored by the Lolo Forest to tap at least 3,000 cords of bug-killed lodgepole about 20 miles south of Missoula was begun immediately and completed within about six weeks.

In connection with the nation-wide lumber stock survey, reports needed from two delinquent retail lumber dealers in Missoula were obtained by personal interviews.

Under the P(V) COOPERATION, OCD Facility Security Program, lists of the Region One plants which because of their importance to the war

effort, or to the necessary civilian economy, were classed as "Essential Facilities" were prepared for the regional office. Our total list of 121 plants included 83 sawmills.

In extending our series of depletion tables, sawlog drain records showing the sawlog cut by counties and by species in Region One and in southern Idaho were compiled in permanent form.

Within the last few years the Christmas tree industry in western Montana has expanded enormously. Since 1936, Lincoln and Flathead Counties, Montana, have become two of the principal producing areas in the United States. The production records published in our Research Note No. 30, released on October 25, 1943 show that western Montana's 1942 Christmas tree harvest yielded 2,203,000 trees. In comparison, unpublished figures resulting from the 1943 survey recently completed, show that during the 1943 cutting season the total commercial output numbered 3,102,000 trees - a new record cut. In 1941, the previous banner year, 3,082,000 trees were produced.

Total 1943 shipments of Christmas trees by rail amounted to 617 carloads. An estimated 50 to 60 percent of the rail shipments were made in gondola and flat cars, due to a shortage of box cars. Whereas 3,102,480 trees were reported shipped by rail, only 171,730 trees (136 truck loads) were moved to the market in trucks. In the case of truck shipments, a high percentage of the trees were back-hauled on trucks engaged in interstate haul.

B. Wood Preservation

Under pre-war conditions, the total annual requirement for farm fence posts in the region is estimated to have been over seven million,

of which 70 percent were posts cut from western redcedar. Since the beginning of the war many cedar post makers have turned to other work, causing an acute shortage of such posts. As a result there has been an unusual amount of interest in fence post treatment of the less durable kinds of woods. Not only among the farmers but by dealers and individuals having in mind the possibilities of treating native fir and lodgepole pine posts to sell.

The following cases, comprising only a few of the requests for information dealt with, are examples indicating the type of inquiries received.

1. Associated Seed Growers, Inc., Pea Breeding Station, Hamilton, Montana. Anxious to learn of some method of treating wooden stakes to prevent decay. Stakes 3/4" x 2½" x 15". Treatment to provide a satisfactory painting surface.

2. Donald B. Richardson, Denver, Colorado. Requested results of our tests and various methods of treating lodgepole pine fence posts and poles to give longer life without rot.

3. Forest Supervisor, Thompson Falls, Montana. Latest available data on cost of treatment and resultant durability of lodgepole pine, larch, and cedar fence posts.

4. R. C. Newell, County Extension Agent, Cut Bank, Montana. Information concerning use of copper sulphate as a fence post preservative.

5. Grogan & Robinson, Great Falls, Montana (retail lumber yard). Due to scarcity of cedar posts, formerly procured from western Montana, interested in preservative treatment of local fence posts for agricultural use.

6. W. J. Howard, Manager, Montana Retail Lumbermens Association, Helena. Conference with and correspondence concerning the feasibility of a proposal by the association to set up a large open-tank wood-preserving plant to treat lodgepole pine posts.

7. Montana State College (Cooperative Extension Service) by O. W. Monson, Bozeman, Montana. Request for advice, copies of publications and condensed information on fence post treating costs for use in answering numerous inquiries from farmers.

8. A. S. Erickson, Assistant Soil Conservationist, Thompson Falls, Montana. Using our recommendations, a cooperator within the Green Mountain Soil Conservation District, cut, seasoned, and treated 2,800 native fir and lodgepole pine fence posts with a creosote-fuel oil mixture to sell. According to information from Mr. Erickson, considerable interest has been shown in this project by other farmers in the Clark Fork Valley, who have thousands of lodgepole and fir posts in the woodlots of their own farms or standing on lands which they desire to clear for crop production.

Prices quoted on the treated posts offered for sale in this case f.o.b. the farm, near Trout Creek (sizes 3" to 5" top by 6½' in length) were: For 3" top, 25 cents; 4" top, 30 cents, and 5" top, 35 cents.

Inspections of seven service test installations, including two telephone lines, two fence post studies, and the three Northern Pacific test tracks were made as planned.

At the U. S. Range Livestock Experiment Station where nearly a thousand fence posts including five different native woods, treated for the most part with water soluble preservatives were set in 1936, the inspection showed such a small number still in service that after preparing our final summary it will be recommended that this study be considered closed.

Results of our summary of the 1943 inspection of treated ties in the Northern Pacific test track at Thompson Falls, Montana, where nearly all of the original ties have been replaced, indicated that this project should also be discontinued.

In checking the results obtained by different kinds of wood preservative treatments of lodgepole pine in the Gallatin Forest, it was found that for the Gallatin Gateway-Squaw Creek telephone line all test stubs treated with straight creosote and set in 1924 were free from decay and bid fair to last a number of years yet.

For the Bozeman-Flathead telephone line in which several hundred lodgepole pine test stubs were installed in 1929, stubs treated with a mixture of 40 percent coal tar creosote and 60 percent gas oil were alternated with stubs treated with arsenic dust - 6 to 8 pounds to the stub - and arsenic paste. Approximately 46 percent of the arsenic treated stubs were still sound, 37 percent have been replaced, and 17 percent were showing definite signs of rot. None of the gas oil-creosoted treated stubs had been replaced on account of rot. In fact, all appeared to be in excellent condition. All stubs in this test were treated and set under the direction of Ranger L. E. Ewan.

The third installation inspected on the Gallatin Forest was a fence post study of 198 posts located at the old Squaw Creek Ranger Station site which were treated with a 97 percent petroleum-3 percent tetrachlorphenol solution. These posts were treated and set in 1935. Examination showed that five of them had rotted making replacement necessary. All of the others (except three removed for causes other than decay) were in good condition.

Plans for 1944

All told, the Idaho-Montana census of 1943 lumber production and related surveys pertaining to stumpage and log price transactions and

lumber distribution, will require about one-third of a year's time for two men, to be spent during the first half of the year.

Collection and compilation of indispensable lumber and timber products statistics, manufacturing costs, and depletion by cutting records, will require nearly as much time as the census.

In connection with wood preservation investigations, it is estimated that about one and one-half months will be spent by Whitney on inspections and report writing required to bring our service test records up to date. The additional inspections scheduled this year include two fence post installations, one telephone line, and two test tracks, all located within 10 miles of Missoula.

If last year's experience may be a fair criterion of the volume of inquiries to be expected during 1944, approximately three man-months will be spent in furnishing technical information and advice.

RANGE RESEARCH

Range personnel was further reduced on September 1 by Holscher's detail to the Washington Office, preliminary to his transfer there early in 1944 after a brief return to Missoula in the meantime. Evanko graduated in June and entered the Army in August, so Harris was alone at Vigilante. Temporary help was also reduced, but the reduced personnel made definite contributions to the war effort.

Accomplishments and Results

A. Range Research Projects

1. Management Short-grass Ranges - Cattle Range Phase

Range management research at Miles City was confined largely to the cattle phase, but certain limited studies both on cattle and sheep

ranges were carried on at Vigilante by Harris.

April and May were cold and dry and quadrats on cattle pastures charted in June showed a small decrease in density compared to a year earlier, even though precipitation was ample and well distributed in 1942. Growing conditions became favorable, with ample rain in June, and records from other quadrats charted later showed substantial improvement over 1942. In general, density is now back approximately to the pre-drought level.

Experimental cattle started the summer grazing period at lighter weights and gained less during the first month than in 1942 as a result of the cold, dry spring and the consequent reduced spring growth. These records emphasize the extent to which weather variations during comparatively favorable seasons influence forage production and cattle gains.

It was evident in 1943, for the second consecutive year, that tall, rank growth does not make the best cattle forage in eastern Montana. The biggest forage crop since before the drought was produced in 1942 and above average growth occurred again in 1943, but experimental cattle failed to gain at correspondingly high levels. Calves from the moderately and lightly stocked pastures weaned lighter and cows entered the winter both years weighing less than in 1941. Cows did not come through the relatively easy winter of 1942-43 as well as was expected, considering the abundant forage available. Similar conditions were observed and reported by range operators over eastern Montana. Unusually large amounts of salt and bonemeal, which were used in the experimental pastures during these years and

particularly after September 15, indicated below normal nutrients in the heavy forage crop. In spite of this heavy use of salt and bonemeal, at least three cases of what appeared to be mineral or nutrient deficiency appeared in cows on the heavily stocked pastures and caused the death of one cow in 1942. Two additional cows on the heavily stocked pastures have, for the past 3 or 4 months, shown symptoms of acute deficiency even though the forage crop in 1943 was relatively abundant.

Thus it appears that a deficiency in nutrients may occur in favorable as well as in drought years. Whether heavy grazing results in a cumulative deficiency is thus a pertinent question that will be investigated to the full extent possible under the present set-up.

Utilization studies on the summer cattle pastures at the U. S. Range Livestock Experiment Station indicate that when stubbles of grazed blue grama plants average approximately 1 inch and bluestem wheatgrass stubbles average 3 to 3.5 inches, these species will, in favorable seasons, recover quite rapidly from severe drought injury and provide optimum weight gains for cows and calves. Likewise, using the moderately stocked pastures as a guide, satisfactory utilization is reached when 50-55 percent of bluestem wheatgrass plants have been grazed and 40-45 percent of the area of blue grama plants or clumps show evidence of having been grazed. These criteria may be considered as tentative guides to proper utilization on such short-grass ranges.

Utilization data for five years from these pastures indicate that in any given year cattle tend to graze grama to about the same stubble

height regardless of rate of stocking or of the subtype. Furthermore, there has been but slight variation in stubble height from year to year. Degree of use for grama is thus reflected largely by the percent of area grazed rather than by stubble height. This indicates a possibility that relative utilization may be measured quite sensitively by determining the percent of grama area that shows clear evidence of grazing without spending the additional effort required to measure stubble heights needed to compute utilization based on stubble height and percent of plants grazed. In the case of grama, however, it is known that basal leaves may often make regrowth after early grazing and thus obliterate the evidence of grazing. Other factors such as hailstorms, etc., may occur to obscure evidence of grazing so that the actual grazing use may not be clearly evident at the fall examination. Relative utilization can be determined, however, where estimates can be made on a uniform basis.

Also, it may prove feasible to show relative utilization of bluestem wheatgrass based on percent of plants grazed without taking into account the stubble height, but this requires further study before stubble height measurements are dropped from the utilization surveys.

Conservative stocking of short-grass ranges appears to provide some measure of control for stands of pricklypear cactus. Following the droughts of 1934 and 1936, cactus increased to a high point in 1940, both in size and numbers of clumps. Since 1940, as a result of damage by insects, together with competition from perennial grasses and weeds that again became more effective, cactus stands have been deteriorating

so that in 1943 there was but little more than there was in 1936. The increase from 1936 to 1940 was very much the same in both heavily and lightly stocked pastures, but some difference is now evident in the rate of decline since 1940. Numbers of joints per acre have declined more rapidly on the lightly stocked cattle pastures, while numbers of clumps have actually increased there as compared to heavily stocked pastures. However, because cactus deteriorates by the breaking up of large clumps into smaller ones, this increase in clumps is further evidence that the decline is more rapid on the lightly stocked pastures.

During the drought years, cactus played an important role in soil and water conservation and provided an excellent nursery from which partly protected grass plants spread to hasten range recovery. Now that this function of cactus is temporarily over, conservative grazing seems to encourage its decline, possibly because of the greater amounts of unused forage which competes for light, water, and soil nutrients more successfully than is the case under heavier stocking.

Ellison and Woolfolk reported in Ecology in 1937 a high mortality of sagebrush (Artemisia gana and A. tridentata) at Miles City as a result of the 1934 drought. Mortality was again high after the extreme drought year of 1936, but some plants survived and during several favorable seasons produced abundant seed. In 1943 counts were made of the number of sage bushes (both species) on thirty-eight 33x40-foot plots. These counts revealed that there was an average of 1.8 small sagebrush plants (seedlings since the drought years) per square yard and that the plots in one pasture averaged 3.6 seedlings per square yard in addition to the mature plants. If the seasons continue to be

favorable for several more years, and these plants continue to thrive, the entire forage picture may be drastically changed. The influx of young sagebrush is not confined to the experiment station, however, but is evident over many ranges in the vicinity of Miles City. Unless time and environmental factors provide an effective control, research will be needed to show how management may control the spread effectively.

2. Management Short-grass Ranges - Sheep Range Phase

In the 1942 annual report, it was pointed out that sheep tend to graze and regraze the same plants during a single season. Also, they seemed to prefer the closely grazed plants in succeeding years. A clipping study on blue grama and bluestem wheatgrass has shown that repeated clipping at 2 and 3 centimeters, respectively, at the end of the growing season each year was too severe for the plants of those species to maintain full vigor. This, together with the fact that grazing <u>some</u> of the plants that closely may be done without ill effects, seems to indicate that some plants must remain ungrazed each year in order to maintain the range in good vigor. This seems to partially explain why the Northern Great Plains ranges deteriorate more rapidly when grazed closely by sheep than by cattle.

Damage caused by heavy sheep grazing and trampling during the experimental test, 1936-1941, is still evident after two full years of protection from grazing. Quadrats which were heavily grazed by sheep for six years prior to 1942 continued during the past year to improve more rapidly than qudrats which were moderately grazed. Total vegetal density exclusive of cactus on the quadrats which were heavily

grazed is still only 25 percent as great as on the conservatively grazed plots. These records show that the penalties of too heavy grazing by sheep on northern short-grass ranges are far reaching, even with total protection and favorable weather conditions.

3. Management Crested Wheatgrass Range

Grazing by yearling steers in 1943 confirms previous data as to the high value of crested wheatgrass as early forage. Also, the practicability of grazing the species throughout the summer during years of well distributed, above average precipitation was demonstrated by this test. During a 140-day grazing season, April 29 to September 16, the 47-acre field of crested wheatgrass produced 97.9 yearling-months of grazing use and 4,926.6 pounds of gain on 21 steers. Daily gains averaged 1.67 pounds for the season and reached a peak of 2.65 pounds per steer per day for the period June 24 to July 22. The usual mid-summer slump in gains was not evident in 1943 due apparently to the unusually heavy precipitation (6.35") in June and more than normal in August. Gains were at an unusually low rate of 1.31 pounds daily during the first month due to a dry, backward spring.

Utilization of the crested wheatgrass the past season was more uniform and heavier than in any of the previous four years of this test. These results were due partly at least to the fact that grazing started early enough to keep abreast of slower spring growth and partly to abnormally heavy summer rainfall that kept the crested wheatgrass green. Based on a careful utilization survey after the steers were removed, approximately 75 percent of the total growth,

above the soil surface, was utilized. This is a much heavier percent utilization than is feasible or warranted for native range species. Whether crested wheatgrass can withstand such heavy use remains to be seen.

4. Management Summer Ranges - Cattle and Sheep

Results from various studies at the Vigilante Experimental Range were combined last spring into tentative standards or guides to proper use for cattle ranges on which Festuca idahoensis and Agropyron spicatum are dominant. These standards indicate that proper use means that about 75 percent of both species may be grazed on such range to an average stubble height of 3/4 inch for Idaho fescue and 2 inches for bluebunch wheatgrass. These tentative standards for cattle ranges have also been projected, subject to further check, for use on summer sheep ranges.

The utilization survey method in use for summer ranges now consists of (1) classifying the range into three zones of varied use, (2) finding the percent of grazed plants and measuring stubble heights along transect lines. A logarithmic rule was devised which reduces errors introduced when utilization is computed, based largely on average stubble heights.

Results of past utilization surveys of quadrats and other studies at Vigilante provided the basis for recommending heavier stocking on both cattle and sheep ranges. This resulted in an increase of 10 to 25 percent last season on several Beaverhead National Forest ranges. An inspection trip was made jointly with Messrs. Sandvig, Schowe,

Harris, and Hurtt in September over allotments where increased numbers were permitted. It was agreed that the increases seemed well justified even during a season somewhat less favorable than some recent years. The heavier stocking resulted in a substantial increase in meat production from the summer range and a saving of forage on lower ranges for winter use, without apparent risk to the welfare of the range.

An empirical study was started on the Vigilante Sheep Allotment in 1943 to determine the practicability of removing the growing accumulation of old grass by heavy forced sheep grazing and trampling and preventing a reaccumulation by closely controlling grazing use. After one season the test gave good evidence that enough of the old grass was removed by trampling and heavy use, but without evident damage, to materially increase the availability of next year's grass crop, thereby rendering the type more attractive to the sheep and more productive.

5. Artificial Revegetation

A test of the "preparatory crop method" of preparing cheatgrass infested abandoned fields for seeding to crested wheatgrass gave very good results in 1943. The initial field test in the Bitterroot Valley gave almost complete control of cheatgrass in one growing season and gave about 1½ tons of rye hay per acre as a by-product. The value of the hay was more than enough to cover all costs and the stubble provided an ideal seedbed for crested wheatgrass. The procedure was (1) plow the green cheatgrass under in April and seed the land to spring rye; (2) mow the rye for hay in July, while still green and

before seed from surviving cheatgrass plants had shattered; and (3) drill crested wheatgrass into the stubble in the fall. This method serves the multiple purpose of (1) substituting a more valuable perennial forage crop for cheatgrass stands of undependable production, (2) increasing feed crop production on low-value land, thus releasing better land for production of other crops, and (3) allowing for increased production without overgrazing other currently productive range land.

Plantings in Judith Basin gave good success where crested wheatgrass and a few other species were drilled into new grain stubble without soil preparation, but results became poorer with each year that elapsed between the last season of cropping and the reseeding. No plants of about 20 species survived where seeded on land which had been abandoned for 4 or 5 years and supported a heavy stand of cheatgrass, but several succeeded quite well on new stubble. Only 8 of the 20 species produced established plants and none produced good stands on land "abandoned" for two years. These early results indicate that besides crested wheatgrass, Judith Basin is adapted to slender wheat, meadow brome (Bromus erectus), sheep fescue, and Ladak alfalfa.

Drilling blue grama very shallowly in late spring (the middle of May) on an unprepared seedbed (abandoned land with a cover of Russian thistles and other weeds) gave a good stand. The same type of seeding in early spring (middle of April) gave fairly good results, but fall seeding gave very poor results. Disking before seeding appeared to hamper establishment as did covering to depths of 1/2 and 3/4 inch.

Agropyron cristatum, A. intermedium, A. trachycaulum, A. spicatum, A. subsecundum, Bromus inermis, B. inermis (Parkland), Dactylis glomerata, and Phleum pratense have shown a good deal of promise for seeding on well prepared soil at high altitudes as demonstrated by July 1942 plantings at about 9,300 feet elevation on the Gravelly Range at Vigilante. Also, the value of reseeding on depleted but potentially productive mountain parks has been convincingly demonstrated on Little Granulated Mountain area (7,500 feet elevation) on the Beaverhead. Light disking followed by broadcast seeding of perennial grasses in 1940 has increased forage production many fold. Dactylis glomerata is the outstanding species, but Agropyron intermedium, Bromus inermis, B. erectus, Poa compressa, and Arrhenatherum elatius are also decidedly successful in spite of heavy grazing each season. Agropyron cristatum formed a fair stand but seems inferior to the other species mentioned. Some success was obtained by broadcast seeding on a nearby area with remnants of native grasses but which was too steep to allow covering of the seed by cultural treatment. These plantings demonstrate that the production may be greatly increased by reseeding on a good site where the cover has been depleted by overgrazing.

Plantings made on cutover land on the Blacktail Unit of the Bitterroot in 1940 show good establishment from broadcasting grass seed on fresh skid trails, but that each season that elapses between logging and seeding operations reduces the chance for good results. Covering the seed by hand raking gave much better stands than were obtained without covering on skid trails which had weathered for a year.

B. Technical Advice and Guidance (Extension)

Because of the lack of a clear-cut distinction between research and extension, several phases of the latter have already been covered. Application of research findings through 10 to 25 percent increases in stocking on several Beaverhead ranges is an outstanding example of research at work. More meat was produced and better use of available feed supplies was a result. Findings on opening dates and other studies at Vigilante are furnished currently to the Beaverhead for guidance. Assistance given in various ways to the Region in the koksaghyz program at Missoula is another example. Also, Hurtt served on the Montana Agricultural Goals Committee and attended two State meetings and numerous meetings of the Agricultural Committee of the local Chamber of Commerce, of which he is a member.

Formal field days were minimized because of the need for restricted travel, but in July an advisory committee of Southeastern Montana Stockgrowers Association spent a day going over our work at the U. S. Range Livestock Experiment Station. Several prominent stockmen of the State spent the day discussing results and displayed great interest in the research program.

Harris discussed range research purposes and gave a few highlights of results at a Kiwanis meeting in September. Besides many letters, various range men have discussed management and reseeding problems with individual range men.

Numerous articles in livestock journals and one Farmers' Bulletin (No. 1924), as listed specifically in another section, were published during the year on such subjects as earlier marketing of range live-

stock, artificial range revegetation, and salting to get more uniform utilization. A more technical article in Ecology described a detailed method for measuring the utilization of bluestem wheatgrass. An article was carried in the Montana Farmer to encourage fall reseeding. Besides these, numerous brief newspaper articles on range subjects were promoted by the range personnel.

C. New Activities

No completely new activities were undertaken by the range division in 1943, but some preliminary steps were taken looking toward a study of a deficiency condition in some cows on heavily grazed pastures at Miles City.

Plans for 1944

A. Range Management

Because prospects are poor for replacements, plans for the coming year must be made flexible so that most productive and urgent work will have first consideration, even if two or three range men enter military service. Concentrated efforts will be made to promote sound measures for maximum production of range products during the war and post-war period. This includes well directed extension effort and prompt publication of all findings that point to this goal.

The cattle range management project at the U. S. Range Livestock Experiment Station has high priority and can be continued on a maintenance basis even with reduced personnel, although some sacrifices of vegetal studies will in that event be necessary. Mr. Quesenberry recently suggested carrying the project with present cows until the fall of 1945 instead of closing them out as 9-year-olds in the fall

of 1944. He says it is a regular practice to hold cows until they are 10 years old and occasionally older. It was agreed that the additional year will provide a better chance to measure effects of varied grazing on deficiency symptoms and on depreciation and salvage value of cows. The additional year may also provide more definite vegetal response to heavy grazing.

The proposed publications listed in a later section of this report include a revision of Hurtt's drought manuscript for a departmental circular and various shorter articles on numerous phases of management and revegetation projects. This program embraces a critical analysis of available data and clearing of the boards as rapidly as possible for a fresh analysis of short-grass range problems, as a basis for urgent new projects, some of which are already pressing, just as soon as present ones can be wound up by comprehensive analyses and reports. Certain phases of this work will be done in 1944, but some will continue beyond the coming year.

Preliminary plans are being made to blood sample experimental cows perhaps in April and again in November, and thus extend the recent tests to determine whether one group is more deficient in phosphorus than the others. This should be repeated in 1945 also and will not require any material increase in expense or personnel. All detailed records and studies will be adjusted to available personnel.

A manuscript report on the sheep phase of management on short-grass range is in rough draft and should be ready, after some revision, for Washington review this spring. This report will wind up this phase

as an active project, but if possible certain vegetal records should be maintained to follow the course of recovery on overgrazed short-grass range.

The tentative utilization standards prepared at Vigilante for summer ranges and at Miles City for short-grass ranges should be further tested and refined to the extent that personnel will permit. The same is true for the plant development and other studies now under way at Vigilante to guide management of summer cattle ranges.

The more or less empirical test of a means to force heavier utilization of summer sheep ranges on the Beaverhead and elsewhere, that now carry an accumulation of old grass, should be continued if possible. Under past management and stocking practices there has been a progressive accumulation of old forage and a corresponding decline in sheep production. These trends may be reversed if practicable means can be developed without risking the welfare of the range.

At least two noxious weeds, Wyethia and goatweed, (Hypericum perforatum), have become a menace in this region and this problem must be aggressively faced. Goatweed has taken over many thousands of acres to sabotage production in North Idaho and Western Montana, and is moving eastward. Wyethia appears to be spreading and now dominates several thousand acres on the magnificent Gravelly Range of the Beaverhead. Guidance is needed for a post-war program of control of these pests. Observations and studies of an empirical nature are planned for the coming season as a means of providing advice and guidance in such a program.

B. Artificial Revegetation

Spring plantings on depleted forest ranges and on the recently cutover ponderosa pine type on the Bitterroot National Forest will be made to the extent possible for comparison with fall planting results there to provide guidance for post-war management on certain of such lands.

The preparatory crop method of reseeding will be further tested in Western Montana where heavy stands of sheatgrass preclude the successful use of cheaper methods. A few of the more promising species now justify enlarged field trials. Also, certain mixtures which promise better results than pure stands will be tested further.

Preliminary plans have been made to try two or more methods for renovating an old stand of crested wheatgrass at the U. S. Range Livestock Experiment Station. This and many other older stands show evidence of becoming stagnant and sod-bound, and stockmen are asking how to meet the problem. It deserves investigation to the extent possible.

PRODUCTS SUPPLIES SURVEYS PROGRAM

During 1943 the station, cooperating with Region One, made all of the regularly scheduled surveys and reports under this program. These include the monthly lumber production estimates and stocks-on-hand surveys by States, the quarterly reports on factors affecting production, and the log inventory surveys. The station now prepares the report on the factors affecting lumber production for the

Northern Rocky Mountain (Idaho and Montana) District, Region Four furnishing the information for South Idaho. In addition to the district or regional report, this office prepares separate mimeographed releases for the South Idaho, North Idaho, and Montana units. This station also furnishes the Pacific Northwest Station with the factors affecting production and log inventory information for the Northeastern Washington unit of the Washington-Oregon Pine report.

In addition to the regularly scheduled surveys, the station prepared during the year for the information of the War Production Board special reports on the number and capacity of dry kilns, the transportation of forest products by truck and common carrier, the number of persons employed by the lumber and log industry during the winter and summer seasons, the fuelwood situation, the food rationing problem in the lumbering industry, efficiency of labor, and the effect of certain maximum price regulations such as MPR 460 (stumpage) and MPR 348 (logs) on lumber production. Information on the timber resources and its utilization within the region was also furnished some of the district WPB and OPA offices. The station, cooperating with the Region, is prepared to make all the studies and surveys in this region that may be called for under the program during 1944.

EMERGENCY RUBBER PROJECT (KOK-SAGHYZ)

Russian dandelion trials on three 1-acre tracts at Miles City in 1943 demonstrated certain advantages of sandy loam over heavy clay soils and the advantages of fall over spring seeding. Pretreating

the seed appears to be unnecessary in fall planting. Two types of rogue or weed dandelions were recognized and described and proved very difficult to eradicate. Both types occurred in stands from Russian as well as from Miles City seed but were more numerous in the stands from the latter. Roots lifted at the end of their first season were larger and more branched from stands thinned to 5.6 plants per foot of row than from stands of 10.5 plants per foot. However, total yield of fresh roots was greatest from the denser stands and it is questionable if thinning is justified in most cases. About 26 pounds of clean seed were collected from sample plots during the season. The viability of kok-saghyz seed appears to be higher after it has been stored over winter. However, viability was high enough to justify planting immediately after harvesting, if this practice is otherwise desirable. Viability of seed collected about mid-July was somewhat higher than that collected earlier or later.

Research data were considerably restricted by delay and uncertainty in outlining the program for the field season.

The station pretreated the seed used by the Region and gave technical advice and otherwise assisted with the kok-saghyz program at Missoula.

Plans for the kok-saghyz project are not yet known. Presumably certain administrative type studies will be continued through the season on the three acres of test plantings at Miles City even if no new planting is made. A decision as to the investigative work desired should be reached soon enough to avoid the late start and the uncertainty

that handicapped effective efforts last season.

POST-WAR PLANNING

Work Done During 1943

During 1943 the station participated actively in the post-war planning program at the regional, state, and local levels. Director Bradner is the Forest Service representative on the Pacific Northwest Regional Committee for post-war planning and attended all regional meetings. Paul Kemp was the "forest land" representative on the State committee and helped prepare the Idaho report on "Agriculture at the End of 1944." Director Bradner is also on the Industry Committee for post-war planning in Montana but the committee has as yet done little in the way of concrete plans.

Members of the station staff furnished the basic data for the tables, maps, and charts covering forest and range resources in North Idaho for the Pacific Northwest "Atlas for Post-War Planning." Bradner prepared the basic figures and made the preliminary write-up of the section on "Timber Production" for the Idaho State Area report. All in all, members of the station staff spent approximately 54 man-days (429 hours) on general post-war planning work during 1943.

The station participated in the August 1943 preparation of the estimate of the jobs that could be done under a public works program during the post-war period. Staff members spent approximately 13 man-days in preparing the preliminary estimate for projects that should be done under both a short-time and long-range program in the field of research and in helping the region prepare estimates on certain projects

where research personnel would have to participate in the preliminary planning work and surveys. The total cost of the detailed project planning and resulting work program (1-6 years) for research in this region was estimated at $1,050,570.

Contemplated Program of Work for 1944

Increased participation in the general program of post-war planning, particularly at state and local levels, is anticipated by this station in 1944. The station will be called upon to furnish the basic figures on forest and range resources, and to help in analyzing the situation and problems and recommending the work program on these classes of lands for both the Idaho and Montana Area reports. We expect to be called upon also to review at least the final draft of the two reports. Most of this type of work should be completed by February 29, as the Area reports are due on that date. An increase in work at the regional level is anticipated later when the State Area reports are being correlated for the various regions.

The job of reviewing and checking the August 1943 public works program estimates and preparing individual work sheets covering all the projects set up under the program is scheduled for completion early in 1944. The actual job of detailed project planning for the program set up must be gotten underway at the earliest possible date in 1944 if we are going to be ready to start work projects in the demobilization period.

PUBLICATIONS

I. PUBLISHED DURING 1943

A. Departmental Bulletins and Circulars

Short, L. R.
Reseeding to increase the yield of Montana range lands. Farmers' Bulletin no. 1924, February 1943.

B. Outside Publications

Collins, R. W. and Leon C. Hurtt
A method for measuring utilization of bluestem wheatgrass on experimental range pastures. Ecology 24(1):122-125, January 1943.

Friedrich, C. Allan
Reseeding abandoned farm lands to crested wheatgrass will increase range capacity. Montana Farmer, October 1, 1943.

Gisborne, H. T.
Sociological shackles on forestry. Ames Forester Annual, 1943.

Gisborne, H. T.
The challenge to the Society of American Foresters. Jour. For. vol. 41, no. 11, November 1943.

Gisborne, H. T.
Progress in fire control and fire research. Pulp and Paper Magazine of Canada. Issues of May, June, July, August and September 1943. This was a republication of "Milepost of Progress in Fire Control and Fire Research", Jour. For. August 1942.

Harris, Grant A. (Joint author with others of University Idaho)
The influence of sheep grazing on coniferous reproduction and forage on cut-over western white pine areas in northern Idaho. Bull. no. 6, December 1942.

Helmers, A. E.
The ecological anatomy of ponderosa pine needles. The American Midland Naturalist, vol. 29, no. 1, January 1943. (This reports the original research work done by Helmers in partial fulfillment of the requirements for his M.S. degree at the University of Idaho.)

Hurtt, Leon C.
Wisdom of early marketing indicated. American Hereford Jour. September 1, 1943.

Hurtt, Leon C.
Crested wheatgrass builds beef. Montana Stockgrower, January 15, 1943.

Hurtt, Leon C.
Consider the cows when buying bulls. American Hereford Jour. 33(17):48-52, January 1943.

Hurtt, Leon C.
Montana stockmen worried about feed reserves. Western Livestock Jour. April 15, 1943.

Stickel, P. W.
Local application of standard meteorological references. Northwest Science, November 1943.

Woolfolk, E. J.
Salt-bonemeal mixture used in summer months by breeding cows on short-grass ranges. Western Livestock Jour., June 15, 1943.

C. Multilithed and Mimeographed Progress Reports

Division of Forest Products
Cost of manufacturing lumber exclusive of interest and discount for Inland Empire sawmills during 1942. (Confidential - not for distribution.) Mult. April 1943.

Division of Forest Products
Preliminary figures on production of lumber, lath and shingles in Montana, northeastern Washington and Idaho, 1942. Mult. July 1943.

Division of Forest Products
Production of lumber in 1942 by counties in Montana, Idaho and northeastern Washington. (Preliminary statement.) Mimeog. July 9, 1943.

Division of Forest Products
Lumber production by years in the northern rocky mountain region. Revised July 1943 to include 1942 figures. Mult.

Division of Forest Products
Stumpage transactions in the northern rocky mountain region in 1942. Mimeog. September 25, 1943.

Prod

Division of Forest Products
Review of cross-tie specifications as of October 15, 1943.
Mimeog. October 1943.

Survey

Forest Survey
Highlights of the forest situation in western Montana.
Statistical Service, no. 14, May 1943. Mult.

Forest Survey
Highlights of the forest situation in Chouteau County.
Statistical Service, no. 15, June 1943. Mult.

"

Forest Survey
Highlights of the forest situation in Fergus County.
Statistical Service, no. 16, September 1943. Mult.

"

Forest Survey
Highlights of the forest situation in Judith Basin County.
Statistical Service, no. 17, October 1943. Mult.

"

Gisborne, H. T.
Chemical fireproofing of cured grass. Research Note
no. 28, August 2, 1943. Mimeog.

Zach, Lawrence W. and S. Blair Hutchison
The forest situation in Ravalli County, Montana.
Forest Survey release no. 21, July 1943. Mult.

Survey

Zach, Lawrence W.
The application of sample log scaling in Region One.
Research Note no. 31, November 9, 1943. Mimeog.

"

Prod

Whitney, C. N.
Christmas tree production in western Montana in 1942.
Research Note no. 30, October 25, 1943. Mimeog.

II. ESTIMATE OF DEPARTMENTAL PRINTING NEEDS

A. Formal Manuscripts to be Submitted for Departmental Publication Prior to June 30, 1944

Kemp, Paul D., et al
The forest situation in western Montana. U. S. Dept.
Agric. Misc. Pub. 50 to 60 pages, illustrated, 35 charts,
10 pictures.

B. Formal Manuscripts to be Submitted for Departmental Publication During Fiscal Year 1945

Hurtt, Leon C.
Management of northern great plains ranges to minimize the effect of drought. U. S. Dept. Agric. circular, 4000 to 5000 copies.

Woolfolk, E. J.
Management of short-grass sheep range for sustained production. A departmental circular, 3000 to 4000 copies.

III. ARTICLES AND OTHER MANUSCRIPTS PROPOSED FOR OUTSIDE PUBLICATION DURING CALENDAR YEAR 1944

Friedrich, C. Allan
Reseeding depleted spots on mountain ranges. Probably in Montana Farmer.

Friedrich, C. Allan
A preparatory crop method for reseeding cheatgrass infested ranges. The Montana Farmer.

Harris, Grant A.
Poa cusickii an important secondary grass on Beaverhead National Forest ranges. Probably in Northwest Science.

Harris, Grant A.
A logarithmic rule to measure grazed plants in range utilization studies.

Hayes, G. L.
A method of measuring rainfall on windy slopes. Submitted to Washington Office and "being considered for possible publication in Monthly Weather Review." (W.O. letter of July 13, 1943.)

Hayes, G. L.
When and where to measure forest fire danger. To be published in Journal of Forestry. Receipt acknowledged June 1, 1943.

Helmers, A. E.
Initial effects of pruning western white pine. For publication in Journal of Forestry.

Helmers, A. E.
Pruning and thinning as post-war projects. Mimeographed research note.

Holscher, Clark E.
The effects of clipping bluestem wheatgrass and blue grama at different heights and frequencies. Probably for Ecology.

Holscher, Clark E.
Weather and proper grazing controls prickly pear cactus. Probably for a livestock journal.

Holscher, Clark E.
Judging forage utilization on northern great plains cattle ranges. Probably a station publication.

Hurtt, Leon C.
Goatweed spreads in Montana, a menace to production that must be controlled. Probably in Montana Farmer.

Hurtt, Leon C.
Does heavy grazing increase danger of nutritional deficiency disorders in range cattle. Probably the Western Livestock Journal.

Pool, Clifford G.
Seasonal utility of crested wheatgrass range. Probably in Montana Farmer.

Stickel, P. W.
Thirty-year summary of meteorological data for the Priest River station. To be mimeographed as soon as a large amount of editorial work can be done on it.

Whitney, C. N.
Treatability and service life of native woods. For The Timberman.

Whitney, C. N.
The suitability of lodgepole pine for telephone and power line poles. For the Electrical World.

Woolfolk, E. J.
Important range plants of eastern Montana ranges. Probably in National Woolgrowers.

PERSONNEL

NORTHERN ROCKY MOUNTAIN FOREST & RANGE EXPERIMENT STATION

January 1, 1944

OVERHEAD ADMINISTRATION

		Sta. Ovhd.	Prod. Sup.	Kok-saghyz	Post-war Planning
Melvin I. Bradner	Director	77%	12%	1%	10%
S. Dagmar Nelson	Senior Clerk	100%	-	-	-

DIVISION OF FOREST MANAGEMENT

		Fire	Silv.	Mens.	Regen.
Harry T. Gisborne	Sr. Silviculturist	85%	15%	-	-
Austin E. Helmers	Jr. Forester	-	87%	5%	8%
John D. Crowe	Agricultural Aid	100%			
Vandella I. Johnson	Clerk-Stenographer	100%			

DIVISION OF RANGE RESEARCH

		Graz. Man.	Art. Reveg.	Kok-saghyz
Leon C. Hurtt	Sr. Range Examiner	86%	6%	11%
E. Joseph Woolfolk	Assoc. For. Ecologist	88%	1%	11%
C. Allan Friedrich	Asst. Range Examiner	-	100%	-
Clark E. Holscher	Asst. Range Examiner	95%	3%	2%
Grant A. Harris	Jr. Range Examiner	100%	-	-
Clifford G. Pool	Jr. Range Examiner	93%	2%	5%
Merton J. Reed	Jr. Pl. Physiologist	40%	-	60%
Henrietta A. Flood	Clerk-Stenographer	86%	12%	2%

DIVISION OF FOREST PRODUCTS

		T.H. &C.	F.P. Stat.	Wood Pres.	Prod. Sup.	For. Survey
Chester M. Whitney	Assoc. Forester	16%	23%	35%	36%	-
John L. Tims	Jr. Forester	1%	23%	1%	36%	39%
Catherine M. Mead	Clerk-Stenographer	-	26%	-	7%	67%

DIVISION OF FOREST SURVEY

		Forest Survey	For. Prod.	Prod. Sup.	Post-war Planning
Paul D. Kemp	Assoc. For. Economist	95%	-	2%	3%
Lawrence W. Zach	Jr. Forester	84%	13%	-	3%

FIELD STATIONS

Deception Creek Experimental Forest: D. P. Flaccus and Bryn Hammarstrom, (Civilian Public Service Selectees)

Priest River Experimental Forest: John D. Crowe
Miles City Experimental Range: E. Joseph Woolfolk
Vigilante Experimental Range: Grant A. Harris

DIRECT AND INDIRECT COSTS BY FINANCIAL PROJECTS

F.Y. 1944

Financial Project	Indirect Project Costs (Overhead)	Direct Project Costs	Total Costs
Forest Management	$ 2,380	$14,120	$16,500
Range Investigations	4,105	24,300	28,405
Forest Products	1,480	8,750	10,230
Forest Survey	1,435	8,565	10,000
TOTAL	$ 9,400	$55,735	$65,135

DISTRIBUTION OF DIRECT COSTS BY MAIN PROJECTS

F.Y. 1944

Financial and work project	Cars, maintenance & new	Scientific equipment, etc.	Travel expenses other than cars	Salaries		Total
				Regular	Temporary	
FOREST MANAGEMENT						
Silvicultural Inves.	$ 250	$ 306	$ 170	$ 3206	$ 400	$ 4332
Mensuration Inves.	-	121	25	507	165	818
Regeneration Inves.	-	-	23	507	22	552
Fire Protection Inves.	200	525	225	6893	575	8418
Total	450	952	443	11113	1162	14120
RANGE INVESTIGATIONS						
Grazing Management Inves.	250	539	675	15786	2000	19450
Artificial Revegetation	155	180	275	4240	-	4850
Total	405	719	1150	20026	2000	24300
FOREST PRODUCTS						
Timber Harvesting & Conv.	-	65	100	1510	-	1675
Forest Products Statis.	75	300	300	5230	-	5905
Wood Preservation	-	60	100	1010	-	1170
Total	75	425	500	7750	-	8750
FOREST SURVEY						
Survey Forest Resources	96	466	553	7285	168	8565
GRAND TOTAL	$1026	$2562	$2643	$46174	$3330	$55735

R-NRM
REPORTS
Station's Annual

January 29, 1944

MEMORANDUM FOR DIVISION OF RESEARCH

A Brief Analysis of the Station's Financial and Personnel Situation to Supplement the 1943 Annual Report

This is the second full year that the Northern Rocky Mountain Station has operated under a program of work redirected to meet the needs of a Nation at war. In reorienting the program to war emergency needs, some projects were dropped for the duration, some placed on a maintenance basis and some because of their direct tie-in with the war effort have been given increased impetus. Some new studies and services have been inaugurated and members of the staff are being called upon repeatedly for technical advice and guidance in almost every field of forest and range research.

During the 2-year period, however, regular funds have been reduced from $105,950 (F.Y. 1942) to $65,135 (F.Y. 1944). This is a reduction in funds of 38.5 percent. During the same period the number of regular personnel was also reduced from 36 to 18. This is a 50 percent reduction in personnel over and above replacements and additions.

Financing

Allotments to the station for the F.Y. 1944 were $65,135 as compared with $90,850 for the F.Y. 1943. This is (see table 1) a 28.3 percent reduction in funds. Though allotments for all of the financial projects except Forest Products were reduced, the cut was again heaviest in the National Forest Survey project (50 percent in F.Y. 1943 and 60 percent in F.Y. 1944).

Table 1. - Reduction in Allotments and Personnel during 1943

Division	Allotment			Number of Personnel		
	F.Y.1943 $	F.Y.1944 $	Increase or decrease in percent	As of Jan. 1 1943	As of Jan.1 1944	Increase or decrease in percent
Range Investigations	30,100	28,405	-5.6	9	7	-22.2
Forest Management	25,750	16,500	-35.9	5	4	-20.0
Forest Survey	25,000	10,000	-60.0	7	2	-71.2
Forest Products	10,000	10,230	+2.3	2	3	+50.0
Total Station	90,850	65,135	-28.3	25 1/	18 1/	-28.0

1/ Includes the two station overhead positions - the director and the administrative assistant.

The financial situation is not as critical as the above figures would indicate. At the start of the fiscal year the funds were budgeted on the assumption that emergency appropriation would be made covering overtime obligations. As the overtime obligations for F.Y. 1944 are estimated at some $9,596, regular funds available for use during the fiscal year will amount to $74,731 ($65,135 + $9,596). This assumes, of course, that a supplemental appropriation covering overtime obligations will be made. That such a supplemental appropriation be made early is essential as the station will run out of money early in April 1944. During F.Y. 1943 this station met its overtime obligations out of the original appropriation of $90,850. A comparable figure for F.Y. 1944 would therefore be $74,730. On this basis the station will actually suffer a reduction in funds of 21.6 percent instead of 28.3 percent as indicated in the first paragraph.

Budgeting on the assumption that a supplemental appropriation would be made to cover overtime obligations enabled the station to soften the shock of immediate separations for lack of funds which the critical cut in research appropriations made necessary. It was possible to carry three out of the five regular personnel that had to be furloughed for lack of funds until they could be transferred to regular positions in Region One administration. It helped the station also in getting a number of jobs done which would have had to go "by-the-boards" if the cuts had been made immediately.

In addition to regular research funds the following work funds have been allotted to this station for F.Y. 1944:

1242233 (11) Emergency Rubber Project (Kok-saghyz)	$2,350
1245911.031 and .032 WPB Products Supplies Surveys	3,240
1241100.020 S & E Nat'l Forest Protection Management	5,499
	$11,089

Though these funds are allotted to finance new and additional work or projects over and above the regular research program, they do help out the general financial situation at the station. This is particularly true of the Kok-saghyz Rubber and Emergency Fire Protection working funds where certain of the regular personnel are reimbursed for time actually spent on the projects. Such an advantage has not been taken of the Products Supplies Surveys fund as this program is considered by both the region and the station as one of the more important jobs in support of the war effort that can and should be done by regular personnel and financed from regular funds. Most of the work that must be done requires the services of our best qualified and experienced men in the fields of forest production and utilization.

It is becoming difficult to reduce station overhead sufficiently each year to keep pace with appropriation losses. Based on regular funds (including overtime reimbursements) station overhead for F.Y. 1944 is 14.1 percent of the total as compared with 13.8 percent in F.Y. 1943. If the working funds are included, however, this year's station overhead would be only 12.2 percent of the total.

The station now has military furlough salary obligations for the post-war period as follows:

Forest Survey	$6,360	per year
Range Investigations	5,020	" "
Forest Management	5,640	" "
Station Overhead	4,580	" "
	$21,600	" "

These obligations must be kept in mind as they must be met after the war is over.

Personnel

During the calendar year 1943 the station's regular personnel was reduced in number over and above replacements and additions by 28 percent (see table 2). In numbers, the reduction was from 25 to 18. Of the seven members lost, one (Kvanko) went to the Army, one (Stickel) resigned, one (Holscher) was transferred and four were furloughed for lack of funds. Of the four furloughed for lack of funds, three (Wm. Meyer, John LaCasse and Helen Forney) obtained regular positions with the Region (One).

Table 2 gives the present selective service status of all male employees now on the pay roll at this station. All but two of the seventeen are regular personnel. D. Flaccus and B. Hammarstrom are Civilian Public Service selectees originally stationed here with the Region One parachute squad and now assigned to us as caretakers at Deception Creek Experimental Forest.

Woolfolk, Lyman, Friedrich, Harris, Pool, Zach and Crowe are our "Pre-Pearl Harbor" fathers. Woolfolk and Friedrich have already been given a 6-month occupational deferment. Recommendation for occupational deferment has already been submitted by your office to the local board in the case of Lyman. He has been given a 60-day emergency deferment by his local board. This station has forwarded you papers in the case of L. Zach. We recommended deferment on the basis of "essential occupation" (forester - forest survey, products, scaling studies). Hurtt is again recommending Harris (superintendent and technical man at Vigilante) and Pool (technical project man at Miles City) for deferment on the basis of "the agronomic character" of their work on range management problems. Official deferment will not be asked for John Crowe (SP-5) superintendent at Priest River. Gisborne thinks Crowe will ultimately be classified 4-F.

Temporary personnel during the past year was limited to a Forest Survey field crew of four men which was disbanded shortly after July 1 for lack of funds; a summer field assistant (woman) at Priest River; the two Civilian Public Service men on silvicultural work during the late fall; a short time field assistant at Vigilante; two Italian internees (laborers) at Priest River; and several man-months of common labor at Miles City, Vigilante and the Missoula forage nursery. Mrs. Helmers, Mrs. Harris and Mrs. Crowe assisted their husbands in the field collection and office recording of data on an hourly paid basis for short periods.

Table 2. - Present Selective Service Status (January 25, 1944) of All Male Employees at NFM Forest & Range Experiment Station

Name	Division	Grade	Present Selective Service Classification						
			1-A	2-A	3-A	4-A [1]	4-F	C.O. [2]	Unclassified [3]
M. Bradner	Director	P-6							x
H. T. Gisborne	Forest Management	P-5							x
L. C. Hurtt	Range	P-5							x
C. N. Whitney	Products	P-5							x
P. D. Kemp	Survey	P-3				x			
C. K. Lyman [4]	Forest Management	P-3	x						
E. J. Woolfolk [5]	Range	P-3		x					
A. C. Friedrich [5]	Range	P-2		x					
G. A. Harris [6]	Range	P-1	x						
A. E. Helmers	Forest Management	P-1					x		
C. G. Pool [6]	Range	P-1	x						
M. J. Reed	Range	P-1					x		
J. L. Tinn	Products	P-1					x		
L. W. Zach [7]	Survey	P-1			x				
J. D. Crowe	Forest Management	SP-5	x						
D. F. Flaccus [3]	Forest Management	C.P.S.						x	
B. Hammarstrom [3]	Forest Management	C.P.S.						x	
Total for Station		17	4	2	1	1	3	2	4

1/ Under 45 years of age when registered. Now over 45.
2/ Conscientious objectors.
3/ Over 45 years of age. Fourth registration. Still unclassified.
4/ Letter requesting occupational deferment sent to local board January 12, 1944. Now temporarily deferred (60 days) to March 1944.
5/ Have been given official 6-month occupational deferment.
6/ Attempt made to obtain official occupational deferment on basis agronomic character of work submitted by this office to Washington Office on January 25, 1944.
7/ Request for official occupational deferment submitted by this office to Washington Office on January 25, 1944.

Forrest S. Romero, Junior Biologist (Fish and Wildlife Service) was inducted in the Army in July 1943. This closed up the work in forest biology under way at this station in cooperation with the Fish and Wildlife Service.

M. Bradner

M. BRADNER, Director

January 1944

BEHAVIOR OF FIRES

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

LINE PROJECT: Behavior. Daily and Seasonal Variables.

PURPOSE OF WORK: To determine the relation between meteorological elements and inflammability of the fuels of forest fires, including the factors of inflammability and how each may best be measured. Involves (1) what to measure; (2) how to measure; (3) where to measure; (4) when to measure; and (5) how to integrate these measurements into a practical scale of inflammability and fire danger.

REVIEW OF PAST WORK: Started in 1922. Five most essential factors selected. Three new instruments invented. Integrating meter developed through five models in 10 years. Two major bulletins and several articles published describing methods.

Four seasons' work on one factor, vegetative inflammability, not conclusive. Five seasons on where to measure by Altitude and Aspect have uncovered some unsuspected and much usable information.

ACCOMPLISHMENTS DURING PAST TWO YEARS: All research work was reduced to a bare maintenance level following the transfer of Hayes and the drafting of Naiman and Cline in 1942, and the resignation of Stickel in 1943. None of these positions were refilled. A new Model 6 Danger Meter was produced in 1942 and has been officially adopted for use in Region 1 in 1944. The Priest River Weather Summary for 20 years was compiled to cover 30 years as planned. Publication awaits necessary editing. Work was started at the request of the office of Recreation and Lands to obtain visual evidence of damage or no damage from Anaconda smelter fumes. Fire danger measurements in the dense-grass, steep-slope fuel types of the Salmon and Snake River Canyons were discussed with representatives of R-1, R-4, and the Grazing Service. Our field of danger measurement advice and guidance was extended to include several forests in R-4.

PLANS FOR 1944: Continue routine danger measurements and the "Large Log" study at Priest River. Commence special measurements in grass types there and at Riggins, Idaho. Visit R-4 and Grazing Service areas. Make heat content (BTU) determinations of grass and weed samples from fire tests. Use spare time of Priest River temporary assistant on this and to measure BTU's in fresh-cut, 10-year, 20-year, and older fire, insect, and logging debris.

DATE OF COMPLETION: Unknown

ASSIGNMENT: H. T. Gisborne and one temporary assistant.

PRESUPPRESSION, DETECTION, SUPPRESSION

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

LINE PROJECT: Control. Fire Control Planning.

PURPOSE OF WORK: To determine the principles, methods, and procedures that will furnish adequate manpower and facilities for fire control at least cost in accordance with local values at stake, occurrence of fires, and fuel types.

REVIEW OF PAST WORK: Systematic, methodical evaluation of all factors most essential to planning for adequate fire control at least possible cost was pioneered in the United States by the late Lloyd G. Hornby of this station from 1931 to 1935. In 1938-40 field work was done on rate of spread of actual fires. A few plots were burned in 1941. Data are insufficient.

ACCOMPLISHMENTS DURING PAST TWO YEARS: An examination of several hundred fire reports as a source of rate-of-spread data by fuel types and danger classes shows that this source is not dependable in this region. Fire protection plans were furnished the Army in 1942 for eight military posts in this region. The questioning of slash disposal methods in this region together with the admitted natural changes taking place in fuel types has revived the need of re-examining our standards of fuel type classification.

PLANS FOR 1944: One phase of slash disposal and of fuel types will be studied as reported under "Behavior of Fires" by measuring BTU contents of various fuels of different ages. The major expansion will be a study of the principles of fuel reduction. C. K. Lyman has been specially obtained for this work. The principle purpose is to determine how much money in the form of post-war labor can be justifiably expended to reduce fuel types so that future costs of fire control will be lowered. This is, therefore, one distinct phase of this "Line Project."

DATE OF COMPLETION: For the Fuel Reduction phase - early 1945.
For the major project - unknown.

ASSIGNMENT: H. T. Gisborne.
C. K. Lyman - Fuel Reduction phase.

January 1944

ECONOMICS OF FIRE CONTROL

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

LINE PROJECT: Economics

PURPOSE OF WORK: Fire control is intended to serve all phases of forestry, the production of timber, livestock, wildlife, recreation, and water. Intensity of fire control suited to one product may be unjustifiably expensive or entirely inadequate for a different product. Control for multiple use or many products may be determined by only one product, the most damageable. Adequate control at least possible cost definitely depends upon these economic objectives, and fire may benefit one product while it damages another. Under this concept "adequate control" has never yet been defined, even though the term is frequently used in Federal and State regulations and even laws.

Practically no research work has been done in this field for the past 10 or 15 years. As many economic concepts have changed radically during this period, some exploratory work is urgently needed.

REVIEW OF PAST WORK: None at this station. Gisborne's "Analysis of the Forest Fire Problem in Regions I, II, III, and IV," dated May 30, 1941, merely stresses the need.

ACCOMPLISHMENTS DURING PAST TWO YEARS: None.

PLANS FOR 1944: The Fuel Reduction phase of the Fire Control Planning line project cannot and should not avoid the socio-economic aspects. Mr. Bernard Frank has already contributed advice, and all such sources and aids will be used but without attempting to do any research in the field of economics. Available information and principles will be used. No work will be done to acquire new knowledge or principles.

DATE OF COMPLETION: Unknown.

ASSIGNMENT: H. T. Gisborne.

January 1944

MANAGEMENT SUMMER RANGES

FIELD DIVISION: Range Research

WORK PROJECT: Grazing Management

LINE PROJECT: Management Summer Ranges

PURPOSE: To test better management and utilization practices for mountain summer cattle and sheep ranges, vegetation and economics of livestock production both considered.

REVIEW OF PAST WORK: Tentative guides as to the proper stocking of both cattle and sheep ranges and for safe opening date for cattle grazing season have been developed from utilization surveys; quadrat, plant development and clipping studies conducted mostly on cattle range at the Vigilante branch station. In general, these studies have shown a gradual increase in forage production under prevailing weather and stocking on the experimental ranges and indicated that heavier stocking and an earlier opening date might be practiced without undue risk to range welfare.

ACCOMPLISHED DURING PAST YEAR: Based on these studies, stocking on the experimental and on several thousand acres of similar sheep and cattle ranges on the Beaverhead National Forest was increased by 10-25 percent (a total of about 1,000 sheep and 800 cattle) in 1943. These increases resulted in greater production from these high summer ranges. This in turn resulted in having forage on fall and winter ranges go farther in saving limited hay reserves for wintering and in greater economy of production due to better balanced use of all available feed resources. Increased stocking appears to be warranted on additional summer ranges in 1944, based on results to date.

Standards of utilization in terms of average height of grazed stubbles and in percent of grazed plants were reported last year but should be tested further under varied seasonal conditions before being considered as final.

A somewhat empirical test was started to determine whether the growing utilization problem on certain summer sheep ranges in the form of an excess accumulation of carry-over grass forage could be solved by forced grazing of sheep. Preliminary results encourage the belief that the declining production of sheep gains can be reversed by practical methods.

PLANS FOR 1944: Continue forced grazing test on the sheep allotment now having the surplus of old feed. Also the necessary nursery work should be done to refine the utilization standards by further measurements and study.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Leon C. Hurtt and Grant A. Harris.

January 1944

METHODS FOR ARTIFICIAL REVEGETATION

FIELD DIVISION: Range Research

WORK PROJECT: Artificial Revegetation

LINE PROJECT: Methods of Revegetation

PURPOSE: To develop practicable low cost methods for artificially revegetating depleted or formerly plowed range lands.

REVIEW OF PAST WORK: A large number of empirical and several controlled experimental tests have been made of various species in at least 25 counties and on varied soil types from 2,300 to 9,500 feet in elevation, including abandoned, plowed and unplowed but depleted range lands. This resulted in the development of good preliminary guides to landowners as to species, season, depth and method of reseeding. Also, these tests, many of which were in cooperation with ranchers, served as practical demonstrations and accelerated reseeding efforts by owners of depleted range lands. These results have been publicized by numerous articles, field days, etc., and more than one million acres of range lands have been reseeded in Montana since this work started in 1933. The reseeding has resulted in very material increase in livestock products in Montana.

ACCOMPLISHED DURING PAST YEAR: Conclusion reached that single and double disking does not provide promising cheap method for preparing soil in heavy stands of cheatgrass (downy brome), but that plowing is necessary. Preliminary tests of "preparatory crop" method indicates plowing reduces cheatgrass competition, and that a cereal crop grown for grain, hay or pasture, controlled cheatgrass and provided sufficient yield of hay to more than cover cost of soil preparation. The stubble provided satisfactory conditions for reseeding without further soil preparation which meets the need for a cheap method and avoids loss of production the first year. Various new tests were made in 1943 on several hundred acres of a recently logged off land in the Bitterroot National Forest where there is great need for increased forage by adjacent ranchers. Also, small-scale plantings were made last fall of various mixed species, including Festuca ovina, that promise green forage later in summer than crested wheat or others. Several species seeded in 1940 at low cost on depleted but unplowed range at 7,500 feet elevation on the Beaverhead National Forest have increased forage production manifold. Farmers' Bulletin No. 1924 and one reseeding article were published in 1943.

PLANS FOR 1944: Test preparatory crop method further for heavy cheatgrass areas by using various grains and forage species (sorghums) to provide closer guides for this practice in Bitterroot and elsewhere. Plan to use reseeding as one means for controlling spread of Hyethia and Hypericum.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: Leon C. Hurtt and C. Allan Friedrich.